

frequently desirable to make a determination of the total nitrogen in an effluent, if only as a check on the estimation of the nitrogen in its various forms of ammonia, nitrate, &c. We would, therefore, suggest these points for a future edition, which will no doubt shortly be called for.

Mr. Fowler is to be congratulated on having compressed a great deal of valuable information within short compass, and at the same time in a clear and pleasant style.

G. M.

ANOTHER TEXT-BOOK OF ZOOLOGY.

Lehrbuch der Zoologie. By Dr. Alexander Goette, Professor of Zoology in the University of Strassburg. Pp. xii + 504; 512 figs. (Leipzig: Engelmann, 1902.) Price 12s. net.

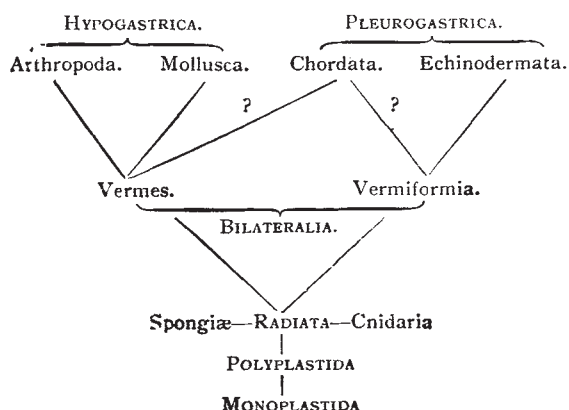
WHAT the illustrious and experienced author proposes in his preface is a text-book for University students—presumed to be serious—a scientific work, a synthetic presentation of the results of analysis, an evolutionist outlook, an exposition in which structure, function, and relationships are to be considered essentially “als Erfolge einer geschichtlichen Wandlung.” This is a noble ideal of a text-book, and to say that the outcome falls short of it is only to say that Dr. Goette is human—a busy investigator and teacher, with much more urgent tasks than writing text-books.

The volume begins with a commendably terse introduction of twenty-five pages, in which the author discusses with clearness the basis of a genetic classification; the concepts of analogy, homology, and homoplasy (“Homoidie”); the essential facts regarding cells and protoplasm; the progress of modern zoology; and the evolution theory. He lays emphasis on the intra-organismal causes of the constitutional variations on which natural selection plays the part of the pruning-knife. It is a lucid introduction, but probably too terse and abstract to rivet the attention of the University student, who desires a wealth of concrete illustration and a non-dogmatic mode of argument. In a subsequent chapter, introductory to the Metazoa or Polyplastids, Goette discusses the beginnings of “body-forming” and the associated tax of “natural death,” the differentiation of tissues and organs, and the nature of sexual reproduction.

The author’s method is to follow the systematic order, and we wish to refer to his classification, which seems ultra-conservative. Thus in the phylum Monoplastids or Protozoa, he recognises two classes—the Rhizopods and the Infusorians. The Sporozoa appear as an appendage of the Rhizopods and the Suctoria as an order of Ciliata. We do not find that Goette gives any reasons for this maltreatment. In the next section, which deals with radially symmetrical animals (“Radiata”), the Sponges are discussed in an elementary fashion in four pages, and classified as horny, flinty, and calcareous—again without a hint of phylogenetic relationships; and while the

Cnidaria or Cœlenterates are more fully discussed, divided into Hydrozoa and Scyphozoa (including Ctenophora), we get no picture of the possible evolution of the phylum. We have the same comment to make throughout, that although the treatment of the various classes and subclasses is clear and terse, there is little of that evolutionary discussion of the phyletic affinities which the preface led us to expect.

Goette divides bilaterally symmetrical animals into Hypogastrica and Pleurogastrica, the former including Vermes, Arthropoda and Mollusca, the latter including Vermiformia, Echinoderma and Chordata. His scheme is as follows:—



In Hypogastrica, the gastrula is elongated in the direction of its transverse axis, and its slit-like blastopore (prostoma) lies ventrally, and coincides anteriorly with the formation of the mouth; in Pleurogastrica the gastrula is elongated in the direction of its longitudinal axis, and the compressed prostoma usually becomes the anus, the mouth being a new formation anteriorly.

In the phylum Vermes, the Nemerteans are ranked, without argument, as a third order of Turbellaria; and the Nematodes are placed as a class beside Annelids in the subphylum Cœlhelminthes, though the cavity of the nematode body is spoken of distinctly enough as a pseudocoel, not a cœlom. Echiurids and Sipunculids are slumped together as Gephyrea, and the appendix to the Vermes includes (1) Bryozoa, (2) Rotifers, and (3) Brachiopods.

There is less eccentricity in the treatment of Arthropods and Molluscs, which receive a full and yet admirably terse discussion. The Trilobites are ranked as an appendix to Entomostraca, the Eurypterids and King-Crabs as a third subclass of Crustacea. The author’s Vermiformia, with which the pleurogastric group of phyla begins, include Chætognatha and Enteropneusta, with Cephalodiscus and Rhabdopleura appended to the latter. After a clear account of the Echinoderma, Prof. Goette passes to chordate animals: he dignifies Ascidiæ, Appendiculariæ and Salpæ as separate classes of the subphylum Tunicata; the Lancelets represent the second subphylum, and Vertebrata the third. Cyclostomes are ranked as a class of Pisces, but distinguished sharply from

the "Euichthyes," which include Plagiostomes, Teleostomes, and Dipnoi. The order of Ganoidei is still allowed to survive, and Polypterus reposes beside Lepidosteus and Amia. In the treatment of Reptiles a recognition of the phylogenetic relations is practically missed by insufficient notice of the extinct classes, and Archæopteryx (der zwar kein wirklicher Vogel war) is discussed under Reptiles rather than under Birds. Placental mammals are dealt with in four groups:—Unguiculata (the Rodents come somewhat quaintly between Chiroptera and Edentates), Ungulata, Natantia (Sirenia beside Cetacea), and Primates. The strongest part of the volume seems to us to be the general discussion of the structure of Vertebrata, but even here the author's extraordinary restraint lessens the interest of many of his paragraphs; we may refer, for instance, to what he says in regard to the thyroid and the thymus.

The figures have been designedly kept simple, but they are very clear and accurate. They are for the most part from original drawings, and many of them are fresh and interesting.

OUR BOOK SHELF.

The Analysis of Oils and Allied Substances. By A. C. Wright, M.A., B.Sc. Pp. xi + 241. (London: Crosby Lockwood and Son, 1903.) Price 9s. net.

THE book is not, nor does it profess to be, a manual for the oil specialist. As a work for the student who wishes to specialise and "as a laboratory guide for chemists who are not extensively engaged in oil analysis, or who have to deal with only a limited number of oils" (to use the words of the preface), it fills a decided want, and is evidently written by one who understands the requirements in such a case. The first chapter, on the occurrence and composition of oils, fats and waxes, may at first sight appear to be superfluous, but it deals systematically with so many substances that are unfamiliar to those relying only on the usual chemical textbooks for their knowledge that it forms a really essential introduction to the subsequent chapters.

In the section on glycerin, a table of specific gravities of glycerin of different strengths is given; an error exists here in the specific gravity of 40 per cent. glycerin, 1.020 being evidently a misprint for 1.1020.

The chapter on the chemical properties of oils, fats and waxes from the analytical standpoint includes careful descriptions of the methods of obtaining the so-called constants; the "ether value" is called the "ester value"—a preferable term. An important comparison is given of Hübl's and Wijs's methods of determining iodine values.

A chapter which contains a somewhat extended description of the properties of the more important oils, &c., with the methods of their investigation, is one which is of especial use to those taking up the study of this subject, but it is doubtful how far the author is justified in saying a little, in a book of this character, on such a debated question as the estimation of beef-tallow in lard—one of the most difficult problems that the oil chemist can have put before him.

On the whole, the author appears to have succeeded in the task he has set himself, and the subject-matter is carefully brought up to date. References to original papers are numerous.

The book is very clearly printed, it is got up in very readable style, and the index appears to have been carefully compiled with a view to completeness.

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Opere di Galileo Ferraris. Vol. i. Pp. xxviii + 492. (Milan: Ulrico Hoepli, 1902.)

THE Italian Electrotechnical Association decided to commemorate its founder, Galileo Ferraris, by publishing his collected works in three volumes, of which the present contains those papers which have the most intimate bearing on electrotechnics. The first, a paper on the use of the compass for galvanometric measurements, was written while Ferraris was assistant lecturer at Turin under Prof. Codazza, the second being his thesis for the doctorate, on the propagation of electricity in homogeneous solids, a mathematical work based on methods similar to those employed by Kirchhoff. The invention of the telephone by Graham Bell, about the year 1877, attracted the attention of Ferraris, who was not slow to read a paper at the Turin Society of Engineers, and to find in the new instrument a means of testing Helmholtz's theorem, according to which the timbre of a sound does not depend on the phases of its components. Another paper is on the intensity of the currents in the telephone. His two elegant theorems on the distribution of constant currents, published in 1879, follow. The introduction of secondary generators or transformers, in 1884, paved the way for his classical memoirs on the Gaulard and Gibbs transformer, on the difference of phase and dissipation of energy in transformers, on some results of experiments with the Ganz transformer, invented by Zipernowsky, Déri, and Bláthy, and an interesting correspondence with Dr. Hopkinson. The alternating current motor forms the subject of the next two papers, and the volume concludes with his treatise on the geometry of vector fields, which was published after his death. This paper affords an example of the spirit in which Ferraris devoted himself to science. His successes as an applied electrician, so far from drawing him aside from theoretical work, seem to have stimulated him to advocate the pursuit of research for its scientific value. From the introductory sketch of his work by Prof. Guido Grassi, we quote the following words:—"Whoever, in scientific researches, always has applications in view never discovers any." Again, at the second conference on electric lighting, in referring to the patient workers that had established the conditions for resolving economically the problem of illumination, Ferraris remarked:—"These men never thought of applications, and it is for this reason that they discovered them; they performed the part most important for applications, they provided the applicable things."

A Text-book of Field Astronomy for Engineers. By G. C. Comstock. Pp. x + 202. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1902.) Price 10s. 6d.

THIS text-book is designed for the considerable class of technical students who need to make practical applications of the methods of spherical astronomy, but cannot devote to the subject the time necessary for a course such as befits those who wish to study astronomy as a science. Teachers who have to undertake the instruction of such students will study with interest the course which Prof. Comstock has adopted after an experience extending over many years, more especially as no attempt is made to reduce the work to mere rule-of-thumb processes. The introductory chapters include the necessary formulæ for the solution of spherical triangles, hints on the orderly arrangement of computations, definitions of coordinates, and a short account of the various corrections to observed data. The methods of observation are classified as rough, approximate and precise according to the degree of accuracy required, and this excellent arrangement not only simplifies the task of the student, but indicates how time may often be saved by avoiding the more refined